REPLY
(Translation)

To : Examiner of the Patent Office

1 Identification of the International Application
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5 Subject matter of Reply

(1) As to the content of Written Opinion

In Written Opinion dated June 28, 2005, there is written an opinion out that the inventions in accordance with claims 1 to 11 do not have an inventive step.

In response to such opinion, claims 1 and 11 are amended by AMENDMENT submitted on the same day as this Reply. We believe that the AMENDMENT allows the inventions in accordance with claims 1 to 11 to have an inventive step for the following reasons.

(2) Description of the present invention

The present invention mainly relates to:

"a lead battery that becomes usable by injecting an electrolyte thereinto, the lead battery including:

positive electrode plates each including a positive electrode grid comprising a Pb-Ca based alloy, and a positive electrode active material retained by the positive electrode grid;

negative electrode plates each including a negative electrode grid comprising a Pb-Ca based alloy, and a negative electrode active material retained by the negative electrode grid;

separators that separate the positive electrode plates from the negative electrode plates;

the electrolyte comprising sulfuric acid; and

a battery container accommodating the positive and negative electrode plates, the separators, and the electrolyte,

wherein the battery container is sealed,

part of the positive and negative electrode plates is immersed in the electrolyte, and

the height Y_0 of the positive and negative electrode plates and the distance Y_1 from the bottom of the positive and negative electrode plates to the level of the electrolyte

satisfy the relation: $30 \leqq Y_1/Y_0 \times 100 \leqq 60$." (claim 1); and

"a lead battery storage method for storing a lead battery comprising: unformed positive and negative electrode plates each having a grid comprising a Pb-Ca based alloy; separators that separate the positive electrode plates from the negative electrode plates; an electrolyte comprising sulfuric acid; and a battery container accommodating the positive and negative electrode plates, the separators, and the electrolyte,

the method comprising storing the lead battery, after forming the lead battery and then decreasing the amount of the electrolyte,

wherein the amount of the electrolyte is adjusted such that the height Y_0 of the positive and negative electrode plates and the distance Y_1 from the bottom of the positive and negative electrode plates to the level of the electrolyte satisfy the relation:
$30 \leqq Y_1/Y_0 \times 100 \leqq 60$, and the battery container is sealed while the lead battery is stored." (claim 11).

Therefore, it is possible to suppress the self-discharge during a long-term storage (instant specification, paragraph [0014]). Also, since the immersion rate in the electrolyte during storage is 30% or more, it is possible to prevent the deterioration in chargeability during battery use due to the deactivation of the negative electrode active material which is caused by the contact between the negative electrode active material exposed to the air and oxygen when the liquid film does not cover the whole surfaces of the negative electrode plates (instant specification, page 11, lines 6 to 12 of paragraph [0019]).

(3) Description of amendment

Based on the paragraph [0019] of page 11 of the instant specification, the lowest value of $Y_1/Y_0 \times 100$ (immersion rate) in claims 1 and 11 was amended to 30.

(4) Inventive step of the present invention

As described above, the present invention relates to a lead battery and a storage method thereof in which part of the positive and negative electrode plates is immersed in the electrolyte, and the height Y_0 of the positive and negative electrode plates and the distance Y_1 from the bottom of the positive and negative electrode plates to the level of the electrolyte satisfy the relation: $30 \leqq Y_1/Y_0 \times 100 \leqq 60$.

On the other hand, Document 1 (JP 2000-195524 A) pertains to a sealed lead battery in which the configuration during battery use is regulated, and this battery is completely different from the lead battery of claim 1 of the present application in which the battery configuration during storage is regulated. Also, Document 1 is silent about the amount of electrolyte during battery storage.

Document 2 (JP 2003-142151 A) is directed to a reserve lead battery in which the electrolyte is discharged during storage and the electrolyte is injected before use. Document 2 discloses discharging not less than 95% by weight of the electrolyte during storage.

Document 3 (JP 2003-346790 A) is silent about the amount of electrolyte during battery storage.

Document 2, which appears to be close to the present invention, discloses a technical concept of reducing the amount of electrolyte during battery storage. Specifically, it discloses discharging not less than 95% by weight of the electrolyte after formation in the battery container and then sealing the battery for storage.

However, according to the present invention, the immersion rate in the electrolyte during storage is 30 to 60 %, i.e., the discharge rate is 60 to 80 % by weight (claim 1 and instant specification, lines 1 to 5 of paragraph [0050]). Thus, the present invention is different in the amount of electrolyte during storage from Document 2 in which

the amount of discharged electrolyte is 95% or more by weight.

Also, since the immersion rate in the electrolyte during storage is 30% or more (the amount of discharge is 80% or less by weight), the present invention can produce the above-mentioned effect of preventing the deterioration in chargeability during battery use due to the deactivation of the negative electrode active material which is caused by the contact between the negative electrode active material exposed to the air and oxygen when the liquid film does not cover the whole surfaces of the negative electrode plates.

However, Document 2 in which the amount of discharged electrolyte is 95% or more by weight does not produce such effect of the present invention.

Further, Documents 1 and 3 do not disclose or suggest the above-mentioned configuration and effect of the present invention.

Therefore, even combining Documents 1 to 3 that are silent about the configuration and effect of the present invention does not easily lead to the inventions according to claims 1 and 11 of the present application.

In view of the above, we believe that the inventions according to claims 1 and 11 of the present application have an inventive step.

Also, since the inventions according to claims 2 to 10 of the present application refer to claim 1, we believe that these claims also have an inventive step.

(5) Conclusion

For the above reasons, we are sure that the inventions according to claims 1 to 11 have an inventive step.

Accordingly, we would like to request an affirmative International Preliminary Examination Report to be prepared with respect to the novelty, the inventiveness, and the industrial applicability of the present invention.